

1 1. A method of modulating an immune response in a mammal, comprising:
2 identifying a mammal that has or is at risk for having a bladder disorder; and
3 administering an isolated nucleic acid comprising an unmethylated CpG sequence
4 to the mammal, to thereby modulate an immune response in the mammal.

1 2. The method of claim 1, wherein the nucleic acid is delivered to the bladder of
2 the mammal.

1 3. The method of claim 2, wherein the nucleic acid is delivered to the bladder by
2 instillation.

1 4. The method of claim 1, wherein the nucleic acid does not encode a naturally
2 occurring polypeptide.

1 5. The method of claim 1, wherein the nucleic acid is contained within a plasmid.

1 6. The method of claim 1, wherein the nucleic acid is delivered by microparticles.

1 7. The method of claim 6, wherein the microparticle comprises a synthetic
2 polymer.

1 8. The method of claim 8, wherein the microparticle comprises a synthetic
2 polymer.

1 9. The method of claim 1, wherein the mammal has a bladder disorder that is
2 characterized by inflammation.

1 10. The method of claim 9, wherein the inflammation is associated with
2 symptoms of interstitial cystitis.

1 11. The method of claim 9, wherein the inflammation is associated with a
2 disruption of the integrity of the bladder lining.

1 12. The method of claim 1, wherein a bacterial infection of the bladder of the
2 mammal is not detected at the time of the administration of the nucleic acid.

1 13. The method of claim 1, wherein the mammal has bladder cancer.

1 14. The method of claim 1, wherein the nucleic acid further comprises a sequence
2 encoding α -MSH.

1 15. The method of claim 1, further comprising administering a second isolated
2 nucleic acid to the mammal, wherein the second isolated nucleic acid encodes α -MSH.

1 16. The method of claim 1, wherein the mammal has a bladder disorder, and
2 wherein administering the isolated nucleic acid results in an amelioration of one or more
3 symptoms of the disorder.

1 17. The method of claim 16, wherein the bladder disorder is bladder cancer and
2 wherein administering the isolated nucleic acid results in a decrease in tumor size or
3 activity.

1 18. The method of claim 16, wherein the bladder disorder is interstitial cystitis
2 and wherein administering the isolated nucleic acid results in a modulation of the
3 immune response from a Th2 response to a Th1 response.

1 19. A method of modulating an immune response in a mammal, comprising:
2 identifying a mammal that has or is at risk for having a bladder disorder; and
3 administering an isolated nucleic acid comprising a sequence encoding α -MSH to
4 the mammal, to thereby modulate an immune response in the mammal.

1 20. The method of claim 19, wherein the nucleic acid is contained within a
2 plasmid.

1 21. The method of claim 19, wherein the nucleic acid is contained within a
2 microparticle.

1 22. The method of claim 21, wherein the microparticle comprises a synthetic
2 polymer.

23. The method of claim 19, wherein the nucleic acid is delivered by a microparticle.

24. The method of claim 23, wherein the microparticle comprises a synthetic polymer.

25. The method of claim 19, wherein the mammal has a bladder disorder that is characterized by an inflammation of the bladder.

26. The method of claim 25, wherein the inflammation is associated with symptoms of interstitial cystitis.

27. The method of claim 25, wherein the inflammation is associated with a disruption of the integrity of the bladder lining.

28. The method of claim 19, wherein a bacterial infection of the bladder of the mammal is not detected at the time of the administration of the nucleic acid.

29. The method of claim 19, wherein the mammal has bladder cancer.

30. An isolated nucleic acid comprising an unmethylated CpG sequence and a sequence encoding α -MSH, wherein the unmethylated CpG sequence comprises an immunostimulatory sequence.

31. A method of modulating an immune response in a mammal, comprising: identifying a mammal that has or is at risk for having a bladder disorder; and administering a peptide that binds to a melanocortin receptor to the mammal, to thereby modulate an immune response in the mammal.

32. The method of claim 31, wherein the peptide is an α -MSH peptide.